WISCONSIN ASSOCIATION OF REPEATERS

Member of Mid America Coordination Council (MACC)

Member National Frequency Coordination Council (NFCC)

Repeater Systems
Frequency Coordination Policies

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TABLE OF CONTENTS:

I. PURPOSE OF DOCUMENT 1

II. GOALS 1

III. STATION TYPES COORDINATED BY W.A.R. 2

IV. FREQUENCY ASSIGNMENTS: PROTECTION BY GEOGRAPHICAL SPACING 2

A. 29 & 50 MHz repeaters 2
B. 2 Meter repeaters 2
C. 222 MHz repeaters 2
D. 440 MHz repeaters 3
E. 900 MHz repeaters 3
F. 1240 MHz repeaters 3
G. Exceptions to the above separation distances 3

V. FREQUENCY ASSIGNMENTS: GENERAL 4

A. Holder of Coordination 4
B. Participation in coordination activities by repeater Holder of Coordination 4
C. Data needed for Frequency Coordination 4
D. In writing policy 4
E. Conditions of assignment 5
F. Time limit for construction of NEW systems 5
G. Coordination assignment time limit for existing stations 5
H. Output Power and HAAT definitions 6
I. "First on Frequency" Principle. 6
J. Changes made to a frequency coordinated station 6
K. (Deleted, October 2008) 6
L. Input frequency interference consequences 7
M. Shutting down of a frequency coordinated repeater station 7
N. Transfer of repeater frequency pairs 7
O. Closed repeaters 7

VI. REPEATER DE-COORDINATION 8

VII. REPEATER STATION GOOD OPERATING PRACTICES 9

VIII. INTERFERENCE TO A COORDINATED REPEATER STATION 10

IX. INTERFERENCE ARBITRATION PROCEDURES 10

X. RECOGNITION OF FM VOICE SIMPLEX 12

A. 6 Meters 12
B. 2 Meters 12
C. 222-224 MHz 12
D. 440-450 MHz 12

XI. RECOGNITION OF DIGITAL COMMUNICATIONS (PACKET RADIO) 12

A. Digital SIMPLEX operations 13
B. Full-Duplex Digital operations 13
C. Operation of packet radio on FM voice simplex frequencies 13

XII. CHANGES TO THIS POLICY 13

XIII. ADDITIONAL POLICIES AND GENERAL GUIDELINES 14

XIV. DEFINITIONS 15

A. OPEN REPEATER 15
B. CLOSED REPEATER 15
C. CTCSS 15
D. AUTOPATCH 15
E. REPEATER SYSTEM 15
F. REPEATER FREQUENCY COORDINATOR 15
G. SHARED-NON-PROTECTED REPEATER (SNP) 16
H. SIGNIFICANT CHANGE 16
I. ACTIVE REPEATER 16
J. INACTIVE REPEATER 16

XV. APPENDIX 1: W.A.R. BAND PLAN 17

A. 10 METER / 29.3 – 29.7 MHZ 19
B. 6 METER / 51.110 - 53.99 MHZ 20
C. 2 METER / 144.500 TO 144.900, 145.100 TO 145.500 AND 146.000 TO 147.990 MHZ 22
D. 1.25 METER / 222.00 - 225.00 MHZ 25
E. 70 CM / 420.00 – 450.00 MHZ 27
F. 33 CM 907.00 - 922.00 MHZ 33
G. 23CM / 1240 TO 1300 MHZ 35
H. 13CM / 2300-2310 AND 2390-2450 MHZ MHZ 37

XVI. APPENDIX 2: CLOSE SPACING OF AMATEUR RADIO REPEATERS 38

XVII. APPENDIX 3: CROSS-BAND REPEATER OPERATION 39

I. Purpose of Document

The purpose of this document is to outline the policies and procedures that have been adopted by the Wisconsin Association of Repeaters, to be used in its efforts to allocate Amateur Radio frequency spectrum for repeater operations. In the spirit of Amateur Radio, and with the cooperation of the repeater owners of Wisconsin, W.A.R. tries to provide repeater frequency coordination with a minimum of interference between owners and users of repeating stations, auxiliary link stations and control stations, in and adjacent to the State of Wisconsin.

II. Goals

It shall be the goal of the Wisconsin Association of Repeaters (W.A.R.) appointed Repeater Frequency Coordinator, and the Assistant Frequency Coordinator, to provide the coordination necessary between operating groups to assure cooperation, within the "spirit" of Amateur Radio. In all cases, the Repeater Frequency Coordinators cannot and should not interfere with the internal operating policies of the individual group. The coordinator's purpose is only to provide a set of frequencies or frequency, if available, which allows the group to develop and implement its operating policies. Because the frequencies available for Amateur Radio repeaters and repeater linking activities are a limited resource, the frequency coordination procedures should be structured in such a way as to provide access to a repeater frequency pair by any group demonstrating its desire to assist the entire coordination process through its cooperation.

The W.A.R. Repeater Frequency Coordinator coordinates repeater and link frequencies on the basis of making maximum frequency utilization of the various Amateur Radio bands. The Repeater Frequency Coordinator should not honor requests for repeater pairs that are contrary to the W.A.R. recommended plans of spacing, power, or location. More than one input or one output frequency for any repeater system on any one amateur radio band is not recommended.

W.A.R. recognizes two fundamental motivations for establishment of an amateur radio repeater station:

1. As a service to other amateurs living or traveling in a defined service area.
2. As an exercise in individual achievement on the part of the station operators.

Both of these motivations are declared equally valid and in the traditional spirit of amateur radio. However, in cases where these two rationales are in conflict, the motivation toward service must prevail over the individual achievement motivation. For example, the desire of an operator to set up a new repeater, largely for reasons of self achievement, in an area already well served by existing repeaters, must be accommodated in a way that does not detract from the existing service area in terms of co-channel or adjacent channel interference.

III. Station Types Coordinated by W.A.R.

The W.A.R. Repeater Frequency Coordinator coordinates only the amateur radio transmitting facilities in those Amateur Radio segments authorized by the FCC for:

1. Repeater stations
2. Control stations
3. Auxiliary link stations

IV. Frequency assignments: Protection by Geographical Spacing

A. 29 & 50 MHz repeaters

All 29 & 50 MHz repeaters are protected by a separation distance of 120 miles.

B. 2 Meter repeaters

All new 2 meter repeater assignments will be provided a separation distance of at least 90 miles from the nearest coordinated repeater within the state on the same channel.

Some adjacent states may require 120 mile separation from their systems. This is per the MACC guidelines and the W.A.R. agrees to abide by their restrictions.

All 2 meter repeaters coordinated on the 15 kHz split frequencies must maintain at least 40 mile separation from any existing repeater that is currently operating on either adjacent frequency pair

New coordination's spaced shorter than 120 miles from co-channel systems shall be required to use CTCSS tone squelch for both encode and decode, will be limited to 100 Watts ERP, and be limited to an antenna height of 400 feet HAAT.

C. 222 MHz repeaters

All 222 MHz repeaters within the state are protected by a separation distance of 70 miles

Some adjacent states may require 120 mile separation from their systems. This is per the MACC guidelines and the W.A.R. agrees to abide by their restrictions.

New coordination's spaced shorter than 120 miles from co-channel systems shall be required to use CTCSS tone squelch for both encode and decode, will be limited to 100 Watts ERP, and be limited to an antenna height of 400 feet HAAT.

D. 440 MHz repeaters

All 440 MHz repeaters are protected by a recommended separation distance of 60 miles.

Restrictions are placed on antenna HAAT or maximum ERP based on the former FCC power and height limits for repeaters. The W.A.R. Frequency Coordination policy guidelines on the maximum ERP that can be used at various HAAT is shown later in this document

Some adjacent states may require 120 mile separation from their systems. This is per the MACC guidelines and the W.A.R. agrees to abide by their restrictions.

New coordination's spaced shorter than 120 miles from co-channel systems shall be required to use CTCSS tone squelch for both encode and decode, will be limited to 100 Watts ERP, and be limited to an antenna height of 400 feet HAAT.

E. 900 MHz repeaters

All 900 MHz repeaters are protected by a separation distance of 60 miles.

Some adjacent states may require 120 mile separation from their systems. This is per the MACC guidelines and the W.A.R. agrees to abide by their restrictions.

New coordination's spaced shorter than 120 miles from co-channel systems shall be required to use CTCSS tone squelch for both encode and decode, will be limited to 100 Watts ERP, and be limited to an antenna height of 400 feet HAAT.

F. 1240 MHz repeaters

All 1240 MHz repeaters are protected by a separation distance of 60 miles

Some adjacent states may require 120 mile separation from their systems. This is per the MACC guidelines and the W.A.R. agrees to abide by their restrictions.

New coordination's spaced shorter than 120 miles from co-channel systems shall be required to use CTCSS tone squelch for both encode and decode, will be limited to 100 Watts ERP, and be limited to an antenna height of 400 feet HAAT.

G. Exceptions to the above separation distances

Separation less than provided in this section may be allowed if approval is obtained from all nearer repeater stations affected, and such approvals are filed in writing with the Repeater Frequency Coordinator. CTCSS encode and decode is required for all short spaced repeaters.

See Appendix 2: Close Spacing of Amateur Radio Repeaters

V. Frequency assignments: General

A. Holder of Coordination

The person or entity that owns, and or built the physical repeater system is considered the holder of record of a frequency coordination. W.A.R. recognizes that many systems are owned by an entity (a club for example), and not an individual. In these situations the Trustee may be an appointment, or simply an honorary position. All requests for coordination or for changes in listing, callsign, sponsorship or trustee information for a repeater or link must be submitted in writing over the signature of the Holder of Coordination. The frequency coordination document and renewal form (see paragraph V.G) from W.A.R. will be sent to the Primary Contact. All other notices and mailings from W.A.R. will be sent to the Holder of Coordination. No frequency coordination may be made without all information being fully documented and submitted to the Repeater Frequency Coordinator for final approval.

B. Participation in coordination activities by repeater Holder of Coordination

The Holder of Coordination and/or Primary Contact of a proposed repeater is expected to actively participate with the Repeater Frequency Coordinator in the task of surveying the frequencies and coverage areas of existing systems in his area in order to select an appropriate frequency for the new repeater.

C. Data needed for Frequency Coordination

To comply with MACC standards, and properly perform our duty as Wisconsin Frequency Coordinator, W.A.R. must maintain a database of information which contains, at minimum, the following items: system amateur radio callsign, input and output frequencies, location (coordinates within 1 second), systems sponsor, user access methods, PL, communication mode, output power, effective radiated power, antenna height above ground level , above sea level and above average terrain, link and control frequencies, antenna patterns, name of the Holder of Coordination, callsign, address, telephone number, e-mail address and if known the date of the original coordination, Primary Contact's name, callsign, address, telephone number and e-mail address if different from the Holder of the Coordination.

Forms for making an application for a new coordination are available from the Frequency Coordinator, Assistant Frequency Coordinator or from the W.A.R. web site: http://www.wi-repeaters.org/forms

D. In writing policy

Only frequency assignments and frequency coordination's confirmed in writing from the Frequency Coordinator or Assistant Frequency Coordinator shall be considered official and binding.

E. Conditions of assignment

The use of CTCSS, tone burst, whistle-up, Touch-tone, or other means of effecting limited access is specified as a condition of assignment MUST BE USED, and operators of repeater stations on assignments sharing the frequency pair or on assignments adjacent to the affected system shall consider the use of such equipment as being implemented and protection afforded as such.

F. Time limit for construction of NEW systems

The time limit when you must start using a NEW repeater pair or auxiliary or control link frequency is established at six (6) months after initial frequency coordination is completed. However, with extenuating circumstances, an additional six (6) month extension can be obtained by requesting this extension in writing. All extensions are at the discretion of the W.A.R. Repeater Frequency Coordinator.

A system not operational at the end of this six (6) month time limit or extension period is considered in-active and the coordinated frequencies will be returned to the W.A.R. frequency pool and made available to other applicants.

If the applicant re-applies for coordination, the past in-activity may be taken into consideration and the coordination request will be granted at the discretion of the Frequency Coordinator.

G. Coordination assignment time limit for existing stations and continuation of frequency assignment.

Frequency coordination assignments for all repeater, auxiliary and control stations shall be valid for a period of one year from the date of issuance. Renewals of frequency coordination are not automatic and renewal will be extended only upon return of the Annual Renewal Form to the Assistant Frequency Coordinator. This renewal is done by returning the yearly renewal form sent in the second quarter of the calendar year by W.A.R. to each repeater, auxiliary link or control station Primary Contact. This renewal form is due back by August 15th. Those that do not return a renewal form by the due date for more than one year will not have their system listed in the W.A.R. Repeater listing, or the ARRL Repeater Directory, and will be considered for repeater system de-coordination. It is the sole responsibility of the Holder of Coordination to keep W.A.R. informed of their current system information, as well as the Primary Contact's information, and a correct mailing address.

A second renewal form will be sent to the Holder of Coordination and Primary Contact of delinquent repeater operators in the third quarter of the calendar year. If no reply is received by November 15th, the Frequency Coordinator is authorized to de-coordinate a repeater. Requests for re-coordination must be made in person or by proxy at the next W.A.R. meeting to the Board of Directors and the members present. The members present must vote on the proposed re-instatement.

H. Output Power and HAAT definitions

Although the FCC has eliminated specific power limitations on repeater transmitter Effective Radiated Power (ERP according to Height Above Average Terrain (HAAT), they have left the decisions on power limitations up to the individual frequency coordinator. W.A.R. adheres to the former limits as shown below.

For frequencies from 29.5 MHz to 420 MHz:

1. Antenna HAAT of 100 ft and lower - 800W ERP
2. HAAT 105 to 525 feet - 400W ERP
3. HAAT 525 to 1050 feet - 200W ERP
4. HAAT above 1050 ft - 100W ERP

For frequencies above 420 MHz, where permissible by FCC rules, the following power limitations will apply:

1. Antenna HAAT of 105 ft and lower - 800W ERP
2. HAAT 105 to 525 ft - 800W ERP
3. HAAT 525 to 1050 ft - 800W ERP
4. HAAT above 1050 ft - 400W ERP

If a request for a repeater exceeds WAR's policy for height and ERP, the trustee may attend a WAR meeting and present his case to the membership. The case will be voted on by the members present at the meeting.

I. "First on Frequency" Principle.

Just as in FCC broadcast allocations and in use in two-way radio systems, the "first on frequency" rules will be applied in the Amateur Radio repeater frequency coordination done by the Repeater Frequency Coordinator, as long as coordination rules are observed. This rule says that "existing repeaters have first rights to continued use of their frequencies and reasonable service areas, and the effective use of an existing repeater station should not be appreciably diminished by a new repeater.

J. Changes made to a frequency coordinated station

Any frequency assignment, i.e., coordination, will immediately become invalid if the station makes significant changes. Such changes require a new application for coordination. The term significant change is defined in the definitions section of this policy. Please contact the Frequency Coordinator for additional information.

K. (Deleted, October 2008)

L. Input frequency interference consequences

Frequency assignments shall be made with as much, if not more, weight given to the consequences of the transmissions of fixed and mobile stations on the input frequency, as compared to the consequences of the output signal of the coordinated station itself. The majority of coordination and interference problems arise from individual stations keying other repeaters in addition to the one intended.

M. Shutting down of a frequency coordinated repeater station

Repeater station trustees who shut down their repeater station for a period of over 60 days must notify the Repeater Frequency Coordinator in writing of this shutdown. If notification is not received, the repeater will be considered to be in-active. If the repeater station is removed from service, or is sold, the Holder of Coordination should write a letter to the Repeater Frequency Coordinator, relinquishing that frequency pair.

N. Transfer of repeater frequency pairs

Repeater pairs are transferable, but all changes must be filed with the Frequency Coordinator, who will determine if the changes are acceptable for re-coordination. In situations where one sponsor sells his repeater system to another sponsor, the same frequency may be re-coordinated to the new sponsor. The current Holder of Coordination should relinquish the frequency in writing to the Frequency Coordinator. The new sponsor must make a full application in writing to the Frequency Coordinator for re-coordination.

The current Holder of Coordination must complete and send in the Relinquish Holder of Coordination Form. If no significant changes are made to the repeater, the new Holder of Coordination must complete and send in the New Holder of Coordination Application Form. If significant changes are made the new Holder of Coordination must complete and send in a Coordination Application Form. Forms are available from the W.A.R. web site www.wirepeaters.org/forms.htm

O. Closed repeaters

The appropriateness of a closed repeater is in some circumstances recognized. However, requests for closed repeaters on the 2 meter band, especially those proposing wide-area coverage will be discouraged. Rationale: 2 meter frequency pairs are a limited and valuable resource and should be made available to the majority of Amateur Radio operators. It should be noted that the upper VHF and the UHF bands offers privacy to closed repeaters that is not possible on 2 Meters, greatly aiding in the problem of unwanted use of private repeaters.

NOTE: *It should be recognized that just because a repeater system uses CTCSS or other means to protect its input frequency, it is not to be considered a closed system.*

VI. Repeater De-Coordination

W.A.R. has the right under certain circumstances to revoke a coordinated frequency as outlined below:

1. If a repeater system is ordered permanently shut down by the FCC for any reason.

2. A new frequency coordination for a repeater pair, auxiliary link or control link frequency that is not operational at the end of its original six (6) month time limit or extension period is considered in-active and the coordinated frequencies will be returned to the W.A.R. frequency pool.

3. To be considered an active repeater, the Primary Contact or Holder of Coordination must renew the repeater frequency coordination annually. This renewal is done by returning the renewal information form sent out by W.A.R. annually to the Primary Contact and Holder of Coordination of record for each repeater, auxiliary link or control station. Repeater Holders of Coordination that do not reply to this annual renewal for over one year, will have their systems considered as in-active and will be subject to de-coordination.

4. If in the course of research, an allocation is determined to be in-active and the Holder of Coordination of record cannot be located by registered mail, the coordination will be dropped by the Frequency Coordinator, and the frequency returned to the pool.

5. Coordinated repeaters are expected to maintain good engineering practices as a condition of coordination. Efforts are to be made to minimize interference problems due to equipment operation.

6. If a repeater system bears primary responsibility in a case of interference to another repeater system and refuses to cooperate with the other trustees involved and/or the Repeater Frequency Coordinator, after repeated requests, the Frequency Coordinator can recommend de-coordination of this repeater system, and turn over the documentation of these problems to the W.A.R. Board of Directors for de-coordination consideration at its next meeting. If W.A.R. upholds the Repeater Frequency Coordinator's suggestions, the Frequency Coordinator will then notify the appropriate FCC field office with a request that they shut down the offending repeater system.

7. De-coordinated frequencies will be placed back into the frequency pool for future coordination by the Frequency Coordinator.

VII. Repeater station good operating practices

Repeater station owners and users are expected to maintain good engineering and operating practices and use common Amateur Radio courtesy on repeater stations, as outlined in the FCC rules. Good Amateur Radio practices promote harmony and prevent unwanted interference to other operating repeater systems.
Some guidelines are:

1. Repeater owners should encourage repeater users to use the minimum amount of power necessary to operate into the repeater system. This prevents unwanted keyups of other systems on the same frequency, or on nearby adjacent channels.

2. Repeater owners should encourage and help their repeater users to keep their equipment operating on the frequency intended and with audio deviation not to exceed 5 kHz. Repeater stations on frequencies coordinated 15 kHz from another nearby 2 Meter repeater must advise their users to limit their transmitter deviation to no more than 4.0 kHz maximum. All system operators are encouraged to incorporate automatic devices to tell users that they are exceeding the maximum allowed deviation.

3. Repeater owners should maintain their system in such a way that it maintains proper operating frequencies and have audio limiting capabilities on the repeater transmitter to prevent over deviation.

4. Repeater station ERP should balance with the input receive capabilities. Excessive ERP will encourage operators to use more power to access the system, thereby creating an atmosphere of potential interference to other repeater stations.

5. Repeaters owners are encouraged to use state-of-the-art equipment on their repeaters, with sufficient filtering on the input and outputs to prevent adjacent channel interference both on receive and transmit.

VIII. Interference to a Coordinated Repeater Station

The following outlines the policy for dealing with interference between repeaters, owners, trustees and users. This policy is in accordance with FCC rulings and guidelines:

1. If an uncoordinated repeater causes harmful interference to a coordinated repeater, the primary responsibility for correcting this interference rests with the owner of the uncoordinated repeater system.

2. If both systems are coordinated, the Holder of Coordination of the most recently coordinated system bears the Primary responsibility for correcting the interference. (See "First on Frequency" definition)

3. In cases where a repeater in Wisconsin is involved in interference with a system operated outside Wisconsin, the Repeater Frequency Coordinator, when called upon, will work with the Repeater Frequency Coordinator from the other state and will adhere to the guidelines listed above when dealing with the out state repeater, and their Repeater Frequency Coordinator.

4. If a repeater owner changes location, antenna height, ERP, or other parameters of the system in a manner which causes harmful interfere to other stations (especially to co-channel or adjacent channel repeaters and their users) , that repeater operator bears the primary responsibility for correcting the interference.

   NOTE: *'Harmful Interference" is defined as signals that cause distortion or RF signal blocking of an incoming or repeated signal. Simply hearing other on-channel or co-channel users as a nuisance is not "Harmful Interference".*

IX. Interference Arbitration Procedures

1. Repeater owners receiving harmful interference from another repeater system or its users should document times, conditions, callsigns and describe the type of interference. (Band conditions should be observed in all cases. Abnormal band conditions should not be considered a reason for complaining about interference.) The Holder of Coordination of the repeater receiving the interference should contact the Holder of Coordination of the interfering repeater, with a letter, outlining the problems and include his documentation.

2. If all arbitration attempts fail and the interference problem cannot be solved with the owner of the interfering repeater, the Holder of Coordination of the station being interfered with should contact the Repeater Frequency Coordinator by letter, outlining the problem and providing whatever

documentation is available. Attempts to contact the interfering repeater owner and/or users should also be explained in detail.

3. If the Repeater Frequency Coordinator is called upon, he will need a completely documented history of both repeaters, their coordinated status, dates, times and other pertinent information from both Holders of Coordination. The W.A.R. Repeater Frequency Coordinator cannot handle the job alone and will need cooperation from all individuals involved.

4. If the Repeater Frequency Coordinator cannot resolve the problem, using the guidelines explained above, and the operator bearing responsibility for the interference will not cooperate, will not take reasonable steps to solve the problem, or refuses to cooperate with the Repeater Frequency Coordinator in any reasonable way, the W.A.R. Repeater Frequency Coordinator may then turn over the documentation to a review board which will be created and named by the W.A.R. Chairman. This review board shall make a prompt decision, to either uphold the suggested action of the Frequency Coordinator, or recommend further investigation and/or arbitration with the responsible repeater operators.

    - If the review board upholds the decision of the Repeater Frequency Coordinator, the Repeater Frequency Coordinator shall within 10 days, by certified mail, inform the responsible repeater Holder of Coordination that his frequency has been de-coordinated.

    - Upon receipt of confirmation of delivery of the de-coordination letter, the Repeater Frequency Coordinator will then write the FCC Field office under whose jurisdiction the interfering repeater is located, requesting this repeater be ordered off the air. The Repeater Frequency Coordinator will be responsible for including with the request, an outline of all procedures taken and documentation that proper procedures were followed. Copies of all correspondence will also be included. At this point, final action rests with the involved FCC Engineer-in-charge with the District.

5. A coordinated station desiring FCC intervention or enforcement to eliminate interference shall first submit their complaint and request in writing to the W.A.R. Chairman. W.A.R. will have 90 days to resolve the complaint. If, at the end of the 90 day period, the complainant still desires FCC action, W.A.R. shall submit the complaint to the FCC along with W.A.R.'s findings and recommendations. All cases of apparent malicious interference will be forwarded to the respective FCC Field office that have jurisdiction over the area in which the source of interference is located. The action described will be the final step deemed necessary by the Repeater Frequency Coordinator to resolve an interference problem.

X. Recognition of FM voice simplex

W.A.R. also recognizes and will preserve allocated FM voice simplex frequencies which fall within the FM repeater portion of the Amateur Radio bands. The use of these simplex voice frequencies for Digipeaters IS NOT RECOMMENDED, although simplex digital point-to-point operation is permitted as is CW, RTTY or other point-to-point simplex operations per the FCC rules.

A. 6 Meters

The simplex frequencies included in the MACC 6 Meter band plan.

B. 2 Meters

The current voice simplex frequencies are:
146.400, 146.415, 146.430, 146.445, 146.460, 146.475, 146.490, 146.505, 146.520, 146.535, 146.550, 146.565, 146.580, 147.420, 147.435, 147.450, 147.465, 147.480, 147.495, 147.510, 147.525, 147.540, 147.555, 147.570 and 147.585 MHz.

C. 222-224 MHz

Only 223.500 MHz is currently recognized in the 222-224 MHz band for FM voice simplex. But FM voice simplex can be done on any of the 20 kHz spaced frequencies in the 223.400 to 223.740 MHz range. These 20 kHz spaced channels are shared by both voice and digital modes.

D. 440-450 MHz

Only 446.000 MHz is currently recognized in the 420-450 MHz band for FM voice simplex. This is because of the extremely short range expected with low power FM SIMPLEX operations in this frequency range.

XI. Recognition of Digital Communications (Packet radio)

W.A.R. recognizes organized Statewide Digital Communications organizations, recognizes the frequencies currently used for digital communications (such as packet radio), and permits the RECOGNIZED Digital Groups the task of ASSIGNING and DELEGATING frequencies for digital systems and operations on these SIMPLEX frequencies. (It should be noted that a Packet Digipeater or node station is considered a simplex operating system.) Digital systems utilizing input and output pairs are classified as FM repeaters, operating Digital. The frequencies of 441.025/446.025, 441.050/446.050 and 441.075/446.075 MHz. are set aside for Digital Packet repeaters to be managed by the recognized Digital Frequency Coordinator. These frequencies are not subject to coordination policies of W.A.R. Repeaters operating in a digital mode on other FM repeater or auxiliary link frequencies must be frequency coordinated by the W.A.R. Coordinator.

Digital systems that operate SIMPLEX in the auxiliary and control frequency ranges of 446.025 to 446.200 MHz are normally coordinated by the recognized digital coordinator.

A. Digital SIMPLEX operations

The Amateur Radio frequencies currently recognized by W.A.R. for SIMPLEX digital operation in the 2 meter band include 144.910, 144.930, 144.950, 144.970, 144.990, 145.010, 145.030, 145.050, 145.070, 145.090, 145.530, 145.570, 145.590, 145.610, 145.630, 145.670 and 145.690 MHz.

Even though some of these frequencies are spaced 600 kHz apart, a full duplex FM digital repeater cannot be operated on them per current FCC part 97 rules. The simplex frequencies of 144.910, 144.930, 144.950, 144.970 and 144.990 MHz are recognized as being" used for digital operations, but these frequencies are shared with the activities generated by the SAREX space missions. Operators using these frequencies for digital operations must be cognizant of SAREX operation and cease operations when interference will be caused to these operations.

B. Full-Duplex Digital operations

W.A.R. discourages the use of full-duplex digital repeaters on Two Meters, and outside the aforementioned frequencies on the 440 MHz. band.

C. Operation of packet radio on FM voice simplex frequencies

W.A.R. recommends that digital operations (packet radio) do not operate on the nationally recognized SIMPLEX frequencies for FM voice operations on Two Meters, or above 146.000 MHz.

XII. Changes to this Policy

a) All changes to this policy must be approved by the Wisconsin Association of Repeaters.

b) If any group does not agree with this policy or the interpretations of the Frequency Coordinator, they may submit, in writing, a request that the W.A.R. Chairman convene a Board of Appeals, appointed by the Chairman, to review the decision.

XIII. Additional Policies and General Guidelines

A. "Holder of Coordination"

W.A.R. recognizes that many systems are owned by an entity (a club for example), and not an individual. In these situations the "Trustee" may be an appointment, or simply an honorary position. W.A.R. will accept new Coordinations and Renewals from these "entities", and consider them the "Holder of the Coordination", as opposed to the "Trustee", or holder of the callsign on the system.

B. Only those repeaters that have had their Coordination renewed within the last calendar year shall be listed by W.A.R. in our submissions to the ARRL for use in the ARRL Repeater Directory.

C. Any repeater operator that has no contact with W.A.R. for over one year can expect de-coordination of their frequencies.

D. The renewal process shall be separate from the newsletter. There will be a direct mailing of renewal forms to the repeater Primary Contact (and if no response then to the Holder of Coordination). The forms will contain W.A.R.'s latest information. This mailing will occur annually.

E. If a request for coordination exceeds W.A.R.'s policy for height and ERP: The trustee must attend a W.A.R. meeting and present his case to the membership. The case will be voted on by the members present at the meeting.

F. W.A.R. will allow repeaters on 2 Meters using 1 MHz splits on select VHF SNP frequencies. The intent of this is to allow for use in emergency, portable or deployable repeater situations. The system shall be low ERP, with low antenna HAAT, and be in operation for short periods of time (a few weeks or less).

G. W.A.R. has abandoned the use of its Shared Non-Protected pair: 144.630/145.230 MHz due to other surrounding states not adopting this concept. W.A.R. will continue to honor Minnesota's use of this SNP Pair along the Wisconsin Minnesota border.

H. The designation of a repeater as being ARES/RACES affiliated in any W.A.R. databases or published listing must have the approval of, and be confirmed in writing by the State SEC.

I. Lack of candor in communications with the Wisconsin Association of Repeater may be grounds for initiating a withdrawal of coordination (de-coordination) or dismissal of an application.

Individuals demonstrating a non-responsive behavior or lack of candor with WAR, shall not be permitted to re-apply for coordination for a period not less than two years from the most recent de-coordination action. Exceptions to this policy may be made by a general consensus of the WAR board and/or the WAR coordinators to address situations where there may have been extenuating circumstances.

J. As of December 31, 2008, all repeater coordinations (renewals, new coordinations and reinstatements) shall be conditioned upon the use of tone or coded squelch.

For all existing coordinations which do not currently have a tone assignment, the WAR coordinators will work with adjacent states coordinators to make an initial election for a tone squelch frequency. It is anticipated that most tone selections will be consistent with WAR's regional tone plan, but this screening process is necessary to avoid inadvertently recommending a tone which is already used by a co-channel user.

XIV. Definitions

A. OPEN REPEATER
A system whose use by transient operators is welcomed and encouraged.

B. CLOSED REPEATER
A system whose use by transient operators is neither welcomed nor encouraged.

C. CTCSS
Continuous Tone-Coded Squelch Systems such as Private Line (PL), Channel Guard (CG), Quiet Channel (QC), etc.

D. AUTOPATCH
An automatic means of affecting a telephone interconnect using a repeater station.

E. REPEATER SYSTEM
A device or combination of devices, in FIXED locations for receiving radio signals from a Base, Mobile or Portable station and automatically transmitting corresponding radio signals which have been amplified, reshaped, or both for the purpose of extending communication range.

F. REPEATER FREQUENCY COORDINATOR
The Repeater Frequency Coordinator, appointed by the Wisconsin Association of Repeaters (W.A.R.), is the recognized Repeater Frequency Coordinator in the State of Wisconsin. The W.A.R. appointed Repeater Frequency Coordinator will be responsible for the final approval on all matters of repeater frequency coordination in the state of Wisconsin.

G. SHARED-NON-PROTECTED REPEATER (SNP)

A repeater operating on a frequency pair that is assigned without any reference to geographical spacing between repeaters operating on the same frequency pair.

H. SIGNIFICANT CHANGE

A significant change is defined as moving the station location, a change of Holder of Coordination or tone access, or increasing antenna height and/or ERP power.

I. ACTIVE REPEATER

An active repeater must have all of the following characteristics:

1. Available for use (turned on and conforming to W.A.R. technical standards) by the general amateur public or, in the case of a closed repeater by club members only, on its coordinated paired input and output frequencies for a total of at least 305 days per year, excepting the first calendar year of operation.

2. The repeater's Primary Contact or Holder of Coordination must have responded to the annual renewal information request mailed by the Wisconsin Association of Repeaters.

3. The repeater system must have adhered to the information provided in the coordination request form, regarding location, HAAT, ERP, type of access etc. All changes to the information on this form MUST be provided to the Repeater Frequency Coordinator within 30 days of that change, but most preferably BEFORE the change is made.

J. INACTIVE REPEATER

Any repeater system that does not meet the definition of an active repeater will be considered in-active and is subject to de-coordination. A repeater system outage that will last beyond 60 days must be reported to the W.A.R. Repeater Frequency Coordinator or the repeater system will be considered to be inactive.

XV. Appendix 1: W.A.R. Band Plan

W.A.R. coordinates FM and ATV repeaters and auxiliary links on frequencies appropriate for the type of operation according to the following bandplan.

W.A.R. has the duty to not only produce bandplans that satisfy the needs of repeater owners within the State of Wisconsin, but also to protect the interests of coordinated systems in adjacent states, weak signal modes, digital (packet) communications, AM and FM simplex, and satellite uplinks and downlinks. As a frequency coordinator, W.A.R. defines the bandplan for both coordinated and non-coordinated activities within the State of Wisconsin.

It should be noted, that any changes made to the bandplans only affect pending and future coordination applications. Existing, coordinated operations are considered grandfathered and shall be protected as they always have been. No existing coordinated operation is at risk due to the adoption of bandplan changes.

The sub-bands appearing in this document in bold typeface are sub-bands in which the W.A.R. issues coordinations. Those sub-bands in normal typeface are for non-coordinated activities.

In this document, each sub-band is identified. For FM operations, the start and end frequencies specified for the sub-band are the first and last channels available in the sub-band, not the absolute band edges. For example, although the 2m band ends at 148.000 MHz spectrally, the highest channel available on the band is 147.990 MHz, an FM repeater input. That is the carrier frequency of the channel, not the spectral limits of the sub-band, are listed. For all non-channelized operations such as SSB and CW, the start and end frequencies specified are the absolute sub-band edges. AM ATV sub-bands are shown as a 6 MHz segment. AM ATV operations must use VSB filtering of the lower sideband and be NTSC compliant. The visual carrier frequency must be 1.25 MHz above the lower limit of the specified sub-band edge specified, and aural carrier frequency 4.5 MHz above the visual carrier. FM ATV operations on 23cm must use the center of the channel as the carrier frequency.

For the 438-444 MHz VSB ATV channel which uses 443.750 MHz as the aural carrier frequency, the aural channel must use a maximum of 10 kHz deviation (as opposed to the standard 25 kHz) to avoid interfering with adjacent FM operations on 443.725 and 443.775 MHz. All emissions must be at least 50 dB below carrier at the sub-band edge for any ATV operation. Proposed digital ATV operations will be reviewed on a case-by-case basis.

Spectral purity requirements for FM voice repeater and auxiliary link operations will be comparable to modern land-mobile requirements and to FCC requirements for the band in question, whichever is more stringent. The occupied bandwidth shall not exceed 15 kHz on channels spaced every 15 kHz, 16 kHz on channels spaced every 20 kHz, and 18 kHz on channels spaced every 25 kHz. Additional adjacent-channel protection is required for 2m repeaters operating on 15 kHz spacing in the 146 to 148 MHz segment due to the increased possibility of interference to adjacent channels and is considered in the coordination review of those repeater pairs.

Aside from the nominal spectral purity requirements, any repeater or auxiliary link which is found to cause interference to another coordinated repeater or auxiliary link or to a non-amateur service due to
Spurious emissions must cease operation and take the necessary steps to eliminate the interference when so notified of the condition. Failure to eliminate a spurious product creating an interference condition constitutes willful interference and is considered a violation of FCC regulations, which will result in revocation of coordination.

A. 10 Meter / 29.3 – 29.7 MHz

All assignments in this band shall be in accordance with the nationally accepted 10 meter band plan agreed upon by the W.A.R. Currently their are only 4 repeater pairs allocated with 100 kHz spacing between input and output frequencies. 29.600 MHz is recognized as the National Simplex channel on 10 meters.

29.300 - 29.510	Satellite Down-links
29.520 - 29.580	**Repeater Inputs**
29.600	National Simplex Calling Channel
29.620 - 29.680	**Repeater Outputs**

Repeater Pairs

Input	Output
29.520	29.620
29.540	29.640
29.560	29.660
29.580	29.680

B. 6 Meter / 51.110 - 53.99 MHz

All assignments in this band shall be in accordance with the Mid-America Repeater Council (MACC) accepted 6 meter band plan agreed upon by the W.A.R. This plan calls for a 1.700 MHz. spacing for repeater inputs/outputs.

Standard Repeater Pairs

The frequencies between 51.100 to 52.300, and 52.800 to 54.000 MHz are used for repeaters and are coordinated on 20 kHz steps starting with 52.810 MHz output with inputs located 1.7 MHz below the output.

Simplex and Packet

The frequencies between 52.300 and 52.800 MHz are used for simplex and packet operation. Channel assignments start at 52.310 MHz and are spaced on 20 kHz steps.

50.000 – 50.100	CW, Beacons
50.100 – 50.600	SSB, AM
50.600 – 50.980	Experimental, Special Modes
51.000 – 51.100	DX
51.110 – 52.290	**Repeater Inputs**
52.310 – 52.790	Simplex
52.525	National Calling frequency
52.810 – 53.990	**Repeater Outputs**

Repeater Pairs

Input	Output	Input	Output	Input	Output
51.110	52.810	51.130	52.830	51.150	52.850
51.170	52.870	51.190	52.890	51.210	52.910
51.230	52.930	51.250	52.950	51.270	52.970
51.290	52.990	51.310	53.010	51.330	53.030
51.350	53.050	51.370	53.070	51.390	53.090
51.410	53.110	51.430	53.130	51.450	53.150
51.470	53.170	51.490	53.190	51.510	53.210
51.530	53.230	51.550	53.250	51.570	53.270
51.590	53.290	51.610	53.310	51.630	53.330
51.650	53.350	51.670	53.370	51.690	53.390
51.710	53.410	51.730	53.430	51.750	53.450
51.770	53.470	51.790	53.490	51.810	53.510
51.830	53.530	51.850	53.550	51.870	53.570
51.890	53.590	51.910	53.610	51.930	53.630
51.950	53.650	51.970	53.670	51.990	53.690
52.010	53.710	52.030	53.730	52.050	53.750
52.070	53.770	52.090	53.790	52.110	53.810
52.130	53.830	52.150	53.850	52.170	53.870
52.190	53.890	52.210	53.910	52.230	53.930
52.250	53.950	52.270	53.970	52.290	53.990

Simplex

52.310	52.330	52.350	52.370	52.390	52.410
52.430	52.450	52.470	52.490	52.510	52.530
52.550	52.570	52.590	52.610	52.630	52.650
52.670	52.690	52.710	52.730	52.750	52.770
52.790					

Radio Remote Control (R/C)

53.100	53.200	53.300	53.400	53.500	53.600
53.700	53.800	53.900			

C. 2 Meter / 144.500 to 144.900, 145.100 to 145.500 and 146.000 to 147.990 MHz

Standard Repeater Pairs

Unless otherwise described in this policy, all assignments in this band shall be in accordance with the MACC 2 Meter band plan agreed upon by W.A.R.146.520 MHz is recognized as the National Simplex calling frequency.

In Wisconsin, the frequencies between 144.500 and 145.500 MHz used for repeaters are coordinated on 20 kHz steps starting with 144.510 MHz. Repeater inputs are low, with the outputs located 600 kHz above the inputs.

In Wisconsin, the frequencies between 146.000 and 147.990 MHz, used for repeaters, are coordinated on 15 kHz steps starting with 146.010 MHz. Between 146.010 and 146.985 MHz repeater inputs are low, with the outputs located 600 kHz above the input. Between 147.000 and 147.990 MHz repeater inputs are high, with the outputs located 600 kHz below the input.

Frequencies 144.900 to 145.100 MHz & 145.61 to 145.69 MHz

This sub-band is recognized as being used for single channel digital communications including digipeaters or "digital repeaters", e.g. packet radio, using 20 kHz spaced channels. The 20 kHz steps shall be based on 145.010 MHz (channel center).

144.000 - 144.050	EME CW
144.050 - 144.100	General CW Operation
144.100	CW National Calling Frequency
144.100 - 144.200	EME and Weak Signal SSB
144.200 - 144.300	General SSB Operation
144.200	SSB National Calling Frequency
144.275 - 144.300	Propagation Beacons
144.300 - 144.500	Multi-Mode Operation
144.390	APRS Nationwide (1200 Baud FM Packet)
144.510 - 144.890	**FM Repeater Inputs (20 kHz spacing)**
144.910 - 145.090	FM Digital/Packet Simplex (20 kHz spacing)
145.110 - 145.490	**FM Repeater Outputs (20 kHz spacing)**
145.510 - 145.790	FM Digital/Packet Simplex (20 kHz spacing)
145.610	ARES Statewide Packet
145.800 - 146.000	Satellite Sub-Band
146.010 - 146.385	**FM Repeater Inputs (15 kHz spacing)**
146.400 - 146.595	FM Voice Simplex (15 kHz spacing)
146.520	FM National Calling Frequency
146.610 - 147.390	**FM Repeater Outputs (15 kHz spacing)**
147.405 - 147.585	FM Voice Simplex (15 kHz spacing)
147.600 - 147.990	**FM Repeater Inputs (15 kHz spacing)**

2-Meter Repeater Sub-band 144.50-145.50 MHz

Input	Output	Input	Output	Input	Output
144.510	145.110	144.530	145.130	144.550	145.150
144.570	145.170	144.590	145.190	144.610	145.210
144.630	145.230	144.650	145.250	144.670	145.270
144.690	145.290	144.710	145.310	144.730	145.330
144,750	145.350	144.770	145.370	144.790	145.390
144.810	145.410	144.830	145.430	144.850	145.450
144.870	145.470	144.890	145.490		

2-Meter Standard Repeater Band 146-148 MHz

Input	Output	Input	Output	Input	Output
146.010	146.610	146.025	146.625	146.040	146.640
146.055	146.655	146.070	146.670	146.085	146.685
146.100	146.700	146.115	146.715	146.130	146.730
146.145	146.745	146.160	146.760	146.175	146.775
146.190	146.790	146.205	146.805	146.220	146.820
146.235	146.835	146.250	146.850	146.265	146.865
146.280	146.880	146.295	146.895	146.310	146.910
146.325	146.925	146.340	146.940	146.355	146.955
146.370	146.970	146.385	146.985		
147.600	147.000	147.615	147.015	147.630	147.030
147.645	147.045	147.660	147.060	147.675	147.075
147.690	147.090	147.705	147.105	147.720	147.120
147.735	147.135	147.750	147.150	147.765	147.165
147.780	147.180	147.795	147.195	147.810	147.210
147.825	147.225	147.840	147.240	147.855	147.255
147.870	147.270	147.885	147.285	147.900	147.300
147.915	147.315	147.930	147.330	147.945	147.345
147.960	147.360	147.975	147.375	147.990	147.390

2-Meter Digital/Packet Simplex Frequencies

144.910	144.930	144.950	144.970	144.990	145.010
145.030	145.050	145.070	145.090	145.510	145.530
145.550	145.570	145.590	145.610	145.630	145.650
145.670	145.690	145.710	145.730	145.750	145.770
145.790					

2-Meter FM Voice Simplex Frequencies

146.400	146.415	146.430	146.445	146.460	146.475
146.490	146.505	146.520	146.535	146.550	146.565
146.580	146.595	147.405	147.420	147.435	147.450
147.465	147.480	147.495	147.510	147.525	147.540
147.555	147.570	147.585			

2-Meter Shared Non-Protected (SNP) Repeater Pairs

146.460 – 147.460
146.475 – 147.475
146.490 – 147.490

D. 1.25 Meter / 222.00 - 225.00 MHz

Standard repeater pairs

Unless otherwise described in this policy, frequencies between 222.160 and 225.00 will be assigned in accordance with the nationally accepted 220 MHz band plan agreed upon by the W.A.R. 223.500 MHz is recognized as the National Simplex calling frequency.

The frequencies between 222.260 and 223.380 MHz are used as repeater inputs with the repeater outputs located 1.6 MHz above them at 223.860 to 224.980 MHz. These frequencies pairs are spaced 20 kHz apart starting with 222.260 MHz.

Repeater operation on inputs below 222.240 MHz. are discouraged unless other pairs are not available.

Auxiliary Links and Control Channels

The use of certain 10 kHz. split frequencies has been afforded to 220 MHz. link users displaced by the loss of the lower 2 MHz. of the band.

The frequencies between 222.150 and 222.260 MHz and 223.640 to 223.860 MHz are available for linking and control. Channel assignments will be made on a 20 kHz spacing starting at 222.170 MHz and 223.650 MHz within their respective frequency blocks.

Five channels starting at 222.270 MHz may also contain auxiliary stations and are primarily "grandfathered" users that were displaced when the lower 2MHz of this band was reallocated to commercial use. Future assignments will be at the discretion of the Frequency Coordinator.

Simplex and Packet

The frequencies between 223.400 and 223.640 MHz inclusive are available for simplex and packet operation. Channel assignments begin with 223.400 MHz and are on 20kHz steps.

222.000 – 222.150	Weak Signal Modes (EME, CW, SSB, Beacons)
222.100	CW/SSB Calling Frequency
222.170 – 222.250	**Repeater Control / Link (20 kHz spacing)**
222.260 – 223.380	**Repeater Inputs (20 kHz spacing)**
223.400 – 223.580	FM Simplex / Packet (20 kHz spacing)
223.500	National Calling Frequency
223.610 - 223.850	**Links and Control (20 kHz spacing)**
223.860 - 224.980	**FM Repeater Outputs (20 kHz spacing)**

Repeater Pairs

Input	Output	Input	Output	Input	Output
222.260 –	223.860	222.280 –	223.880	222.300 –	223.900
222.320 –	223.920	222.340 –	223.940	222.360 –	223.960
222.380 –	223.980	222.400 –	224.000	222.420 –	224.020
222.440 –	224.040	222.460 –	224.060	222.480 –	224.080
222.500 -	224.100	222.520 -	224.120	222.540 -	224.140
222.560 -	224.160	222.580 -	224.180	222.600 -	224.200
222.620 -	224.220	222.640 -	224.240	222.660 -	224.260
222.680 -	224.280	222.700 -	224.300	222.720 -	224.320
222.740 -	224.340	222.760 -	224.360	222.780 -	224.380
222.800 -	224.400	222.820 -	224.420	222.840 -	224.440
222.860 -	224.460	222.880 -	224.480	222.900 -	224.500
222.920 -	224.520	222.940 -	224.540	222.960 -	224.560
222.980 -	224.580	223.000 -	224.600	223.020 -	224.620
223.040 -	224.640	223.060 -	224.660	223.080 -	224.680
223.100 -	224.700	223.120 -	224.720	223.140 -	224.740
223.160 -	224.760	223.180 -	224.780	223.200 -	224.800
223.220 -	224.820	223.240 -	224.840	223.260 -	224.860
223.280 -	224.880	223.300 -	224.900	223.320 -	224.920
223.340 -	224.940	223.360 -	224.960	223.380 -	224.980

Link and Control Channels

222.170	222.190	222.210	222.230	222.250	222.270*
222.290*	222.310*	222.330*	222.350*	223.610	223.630
223.650	223.670	223.690	223.710	223.730	223.750
223.770	223.790	223.810	223.830	223.850	

*= In spectrum shared with repeater inputs, no new links recommended, and will be handled on case by case basis.

FM Voice Simplex / Packet Frequencies

223.400	223.420	223.440	223.460	223.480	223.500
223.520	223.540	223.560	223.580	223.600	223.620
223.640					

E. 70 cm / 420.00 – 450.00 MHz

Auxiliary link and control frequencies

Frequencies from 426,000 to 426.200, 433.025 to 434.975, 440.000 to 441.000, 445.000 to 445.975, and 441.100 to 441.400 MHz are reserved for control and auxiliary links.

Frequencies from 420.0125 to 420.2000, 424.0125 to 424.9875, and 438.0125 to 438.2000 MHz are also available on a secondary basis to ATV operations. Channel assignments will be made on 12.5kHz "splinter" frequencies.

12.5 kHz channel spacing will be used where needed. The use of CTCSS or similar coded squelch, and directional antennas is encouraged and in some circumstances may be required by the coordinator.

Standard repeater frequencies

Frequencies between 442.000 and 444.975 MHz are reserved for repeater outputs with inputs located 5 MHz above the output. 25 kHz spacing will be used starting at 442.000 MHz. Frequencies between 447.000 and 449.975 MHz are reserved for repeater inputs with outputs located 5 MHz below the input.

On a shared basis with auxiliary stations, frequencies between 440.000 and 440.975 MHz, 441.400 and between 441.500 and 441.975 MHz are available for repeater outputs with inputs located 5 MHz above the output. 25 kHz spacing will be used starting at 440.000 MHz.

Fast Scan TV Repeaters

Present Fast Scan Repeater assignments are listed in the database. No new assignments are recommended using current technology. Consideration of new ways to present Fast Scan TV, such as MPEG compression, or other means will be encouraged.

ATV operation shall have primary status between 420.000 and 432.000 MHz. ATV operation between 438.000 and 444.000 MHz is on a secondary non-interference basis and shall only be used as a coordinated ATV repeater output.

Simplex and Packet

The frequencies between 446.000 and 446.200 MHz inclusive are available for simplex and packet operation. Additionally packet shall have primary status on the paired frequencies of 441.025/446.025, 441.050/446.050, and 441.075/446.075 MHz.

446.000MHz is recognized as the national simplex calling frequency.

The existing coordinated auxiliary links in this segment will not be displaced, however, should the auxiliary operations on these channels in their respective areas of operation cease of voluntary QSY to one of the other auxiliary link subbands, the channels will be made available for their scheduled uses.

Remote base, and temporary cross-band repeaters

The frequencies between 441.4250 to 441.4750, and 446.4250 to 446.4750 MHz are available for remote base and temporary/portable cross band repeaters. Channel assignments are inclusive of the frequencies shown and will be made on 12.5 kHz channels.

Although the term “temporary” might encourage some to just go ahead and use a particular channel, coordination is still required to avoid harmful interference to existing operations.

The existing coordinated auxiliary links in this segment will not be displaced, however, should the auxiliary operations on these channels in their respective areas of operation cease of voluntary QSY to one of the other auxiliary link subbands, the channels will be made available for their scheduled uses.

420.0125 – 420.2000	**FM Auxiliary Links (12.5 kHz spacing)**
420.0000 – 426.0000	**ATV / 421.25 Video, 425.75 Audio**
426.0000 – 426.2000	**FM Auxiliary Links (25 kHz spacing)**
426.2000 – 432.0000	**ATV / 427.25 Video, 431.75 Audio**
432.0000 – 433.0000	Weak Signal (432.100 Calling Frequency)
433.0250 – 434.9750	**Auxiliary Links (25 kHz spacing)**
435.0000 – 438.0000	Satellite only (internationally)
438.0000 – 440.0000	**ATV, 439.25 Video, No Audio Sub-carrier**
438.0250 439.9750	**Auxiliary Links & Packet (25 kHz spacing)**
440.0000 – 441.0000	**FM Auxiliary Links (25 kHz spacing)**
441.0250 – 441.0750	Packet (25 kHz spacing)
441.1000 – 441.9750	**FM Auxiliary Links (25 kHz spacing)**
441.4250 – 441.4750	**Cross-band repeaters/remote base (12.5 kHz spacing)**
442.0000 – 444.9750	**FM Repeater Outputs (25 kHz spacing)**
445.0000 – 445.9750	**FM Auxiliary Links (25 kHz spacing)**
446.0000	National Calling Frequency
446.0000 – 446.3750	Simplex & Packet (25 kHz spacing)
446.4000 – 446.5000	**Cross-band repeaters / remote base (12.5 kHz spacing)**
446.5250 – 446.9750	**FM Auxiliary Links (25 kHz spacing)**
447.0000 – 449.9750	**FM Repeater Inputs (25 kHz spacing)**

70 cm Auxiliary Link Channels

These link channels have primary allocation status.

433.025	433.050	433.075	433.100	433.125	433.150
433.175	433.200	433.225	433.250	433.275	433.300
433.325	433.350	433.375	433.400	433.425	433.450
433.475	433.500	433.525	433.550	433.575	433.600
433.625	433.650	433.675	433.700	433.725	433.750
433.775	433.800	433.825	433.850	433.875	433.900
433.925	433.950	433.975	434.000	434.025	434.050
434.075	434.100	434.125	434.150	434.175	434.200
434.225	434.250	434.275	434.300	434.325	434.350
434.375	434.400	434.425	434.450	434.475	434.500
434.525	434.550	434.575	434.600	434.625	434.650
434.675	434.700	434.725	434.750	434.775	434.800
434.825	434.850	434.875	434.900	434.925	434.950
434.975					

The following Link channels may be issued in pairs for full duplex auxiliary links or individually for point to point or use as control channels. Directional antennas are highly encouraged and may be a condition of coordination.

440.000 - 445.000	440.025 - 445.025	440.050 - 445.050
440.075 - 445.075	440.100 - 445.100	440.125 - 445.125
440.150 - 445.150	440.175 - 445.175	440.200 - 445.200
440.225 - 445.225	440.250 - 445.250	440.275 - 445.275
440.300 - 445.300	440.325 - 445.325	440.350 - 445.350
440.375 - 445.375	440.400 - 445.400	440.425 - 445.425
440.450 - 445.450	440.475 - 445.475	440.500 - 445.500
440.525 - 445.525	440.550 - 445.550	440.575 - 445.575
440.600 - 445.600	440.625 - 445.625	440.650 - 445.650
440.675 - 445.675	440.700 - 445.700	440.725 - 445.725
440.750 - 445.750	440.775 - 445.775	440.800 - 445.800
440.825 - 445.825	440.850 - 445.850	440.875 - 445.875
440.900 - 445.900	440.925 – 445.925	440.950 – 445.950
440.975 – 445.975		

441.225 – 446.225	441.250 – 446.250	441.275 – 446.275
441.300 – 446.300	441.325 – 446.325	441.350 – 446.350
441.375 – 446.375	441.400 – 446.400	

441.500 – 446.500	441.525 - 446.525	441.550 - 446.550
441.575 - 446.575	441.600 - 446.600	441.625 - 446.625
441.650 - 446.650	441.675 – 446.675	441.700 - 446.700
441.725 - 446.725	441.750 - 446.750	441.775 - 446.775
441.800 - 446.800	441.825 - 446.825	441.850 - 446.850

441.875 - 446.875 441.900 - 446.900 441.925 - 446.925
441.950 - 446.950 441.975 - 446.975

Non Paired Auxiliary channels

441.000	441.100	441.125	441.150	441.175	441.200
441.225	441.250	441.275	441.300	441.325	441.350
441.375					

70 cm Simplex Frequencies Voice/Packet

441.025	441.050	441.075	446.000*****	446.025	446.050
446.075	446.100	446.125	446.150	446.175	446.200

***** = National FM Calling frequency

Temporary Cross-band repeaters and remote base operation

441.4250	441.4375	441.4500	441.4625	441.4750	441.4875
446.4125	446.4250	446.4375	446.4500	446.4625	446.4750

70 cm Standard FM Repeaters 442.000 – 444.975 / 447.000-449.975

Input Output	Input Output	Input Output
440.000 - 445.000	440.025 - 445.025	440.050 - 445.050
440.075 - 445.075	440.100 - 445.100	440.125 - 445.125
440.150 - 445.150	440.175 - 445.175	440.200 - 445.200
440.225 - 445.225	440.250 - 445.250	440.275 - 445.275
440.300 - 445.300	440.325 - 445.325	440.350 - 445.350
440.375 - 445.375	440.400 - 445.400	440.425 - 445.425
440.450 - 445.450	440.475 - 445.475	440.500 - 445.500*
440.525 - 445.525	440.550 - 445.550	440.575 - 445.575
440.600 - 445.600	440.625 - 445.625	440.650 - 445.650
440.675 - 445.675	440.700 - 445.700	440.725 - 445.725
440.750 - 445.750	440.775 - 445.775	440.800 - 445.800
440.825 - 445.825	440.850 - 445.850	440.875 - 445.875
440.900 - 445.900	440.925 – 445.925	440.950 – 445.950
440.975 – 445.975		

441.400 – 446.400

441.500 – 446.500*	441.525 - 446.525	441.550 - 446.550
441.575 - 446.575	441.600 - 446.600	441.625 - 446.625
441.650 - 446.650	441.675 – 446.675	441.700 - 446.700
441.725 - 446.725	441.750 - 446.750	441.775 - 446.775
441.800 - 446.800	441.825 - 446.825	441.850 - 446.850
441.875 - 446.875	441.900 - 446.900	441.925 - 446.925
441.950 - 446.950	441.975 - 446.975	

447.000 - 442.000	447.025 - 442.025	447.050 - 442.050
447.075 - 442.075	447.100 - 442.100	447.125 - 442.125*****
447.150 - 442.150	447.175 - 442.175	447.200 - 442.200
447.225 - 442.225	447.250 - 442.250	447.275 - 442.275
447.300 - 442.300	447.325 - 442.325	447.350 - 442.350
447.375 - 442.375	447.400 - 442.400	447.425 - 442.425
447.450 - 442.450	447.475 - 442.475	447.500 - 442.500
447.525 - 442.525	447.550 - 442.550	447.575 - 442.575
447.600 - 442.600	447.625 - 442.625	447.650 - 442.650
447.675 - 442.675	447.700 - 442.700	447.725 - 442.725
447.750 - 442.750	447.775 - 442.775	447.800 - 442.800
447.825 - 442.825	447.850 - 442.850	447.875 - 442.875
447.900 - 442.900	447.925 - 442.925	447.950 - 442.950
447.975 - 442.975	448.000 - 443.000	448.025 - 443.025
448.050 - 443.050	448.075 - 443.075	448.100 - 443.100
448.125 - 443.125	448.150 - 443.150	448.175 - 443.175
448.200 - 443.200	448.225 - 443.225	448.250 - 443.250

448.275 - 443.275	448.300 - 443.300	448.325 - 443.325
448.350 - 443.350	448.375 - 443.375	448.400 - 443.400
448.425 - 443.425	448.450 - 443.450	448.475 - 448.475
448.500 - 443.500	448.525 - 443.525	448.550 - 443.550
448.575 - 443.575	448.600 - 443.600	448.625 - 443.625
448.650 - 443.650	448.675 - 443.675	448.700 - 443.700
448.725 - 443.725	448.750 - 433.750	448.775 - 443.775
448.800 - 443.800	448.825 - 443.825	448.850 - 443.850
448.875 - 443.875	448.900 - 443.900	448.925 - 443.925
448.950 - 443.950	448.975 - 443.975	449.000 - 444.000
449.025 - 444.025	449.050 - 444.050	449.075 - 444.075
449.100 - 444.100	449.125 - 444.125	449.150 - 444.150
449.175 - 444.175	449.200 - 444.200	449.225 - 444.225
449.250 - 444.250	449.275 - 444.275	449.300 - 444.300
449.325 - 444.325	449.350 - 444.350	449.375 - 444.375
449.400 - 444.400	449.425 - 444.425	449.450 - 444.450
449.475 - 444.475	449.500 - 444.500	449.525 - 444.525
449.550 - 444.550	449.575 - 444.575	449.600 - 444.600
449.625 - 444.625	449.650 - 444.650	449.675 - 444.675
449.700 - 444.700	449.725 - 444.725	449.750 - 444.750
449.775 - 444.775	449.800 - 444.800	449.825 - 444.825
449.850 - 444.850	449.875 - 444.875	449.900 - 444.900
449.925 - 444.925	449.950 - 444.950	449.975 - 444.975

*****=Shared Non-Protected

F. 33 cm 907.00 - 922.00 MHz

Standard Repeater Frequencies

The frequencies from 918.000 to 921.000 MHz are coordinated as repeater outputs with the inputs 12 MHz below them on 906.000 to 909.000 MHz. Channel assignments are made on 25 kHz spacing starting at 918.000 MHz.

Auxiliary and Control Links

The frequencies from 909.000 to 910.000, and 921.000 to 922.000 MHz are available for point to point auxiliary links and control receivers. Channel assignments are made on 25 kHz spacing starting at 909.000 and 921.000 MHz respectively.

Digital / Packet

The frequencies from 904.000 to 906.000 and 917.000 to 918.000 MHz are reserved for digital communications.

ATV

The frequencies from 910.000 to 916.000, and 922.000 to 928.000 MHz have a primary frequency assignment for ATV operations.

Spread Spectrum, and other experimental modes

The frequencies from 922.000 to 928.000 may be used on a secondary basis for spread spectrum and other experimental modes.

902.0000 – 902.3000	Weak signal modes (CW, SSB, EME, beacons)
902.3125 - 902.4875	Narrowband FM/DV repeater inputs (12.5 kHz spacing)
902.5000	FM simplex
902.5125 - 902.9750	**Narrowband FM/DV repeater inputs (12.5 kHz spacing)**
902.9875	**Narrowband SNP/portable repeater input**
903.0000 - 903.4000	Weak signal modes (CW, SSB, EME, beacons)
903.4125 - 904.9875	**Digital aux primary, Digital simplex secondary**
905.0250 - 905.9750	**Digital repeater inputs (spacing based on OBW)**
906.0250 - 908.4750	**FM repeater inputs (25 kHz spacing)**
906.5000	**FM simplex**
906.5250 - 908.9750	**FM repeater inputs (25 kHz spacing)**
909.0000 - 915.0000	ATV repeater input
915.0250 - 916.9750	**FM auxiliary links (25 kHz spacing)**
917.0250 - 917.9750	**Digital repeater outputs (channel spacing based on OBW)**
918.0250 - 920.4750	**FM repeater outputs (25 kHz spacing)**
918.5000	FM simplex

918.5250 - 920.9750	**FM repeater outputs (25 kHz spacing)**
921.0000 - 927.0000	ATV repeater output
927.0125 - 927.2875	**FM auxiliary links (12.5 kHz spacing)**
927.3125 - 927.4875	**Narrowband FM/DV repeater outputs (12.5 kHz spacing)**
927.5000	FM simplex calling frequency
927.5125 - 902.9750	**Narrowband FM/DV repeater outputs (12.5 kHz spacing)**
927.9875	**Narrowband SNP/portable repeater output**

33 cm Repeater Pairs, 12MHz split

Input Output
906.025 – 918.025
906.050 – 918.050
906.075 – 918.075

.. and every 25 kHz thereafter through ..

908.925 – 920.925
908.950 – 920.950
908.975 – 920.975

33 cm Repeater Pairs, 25MHz split

902.3125 – 927.3125
902.3250 – 927.3250
902.3375 – 927.3375

… and every 12.5kHz thereafter through …

902.9625 – 927.9625
902.9750 – 927.9750
902.9875 – 927.9875

G. 23cm / 1240 to 1300 MHz

Standard Repeater Frequencies

The frequencies from 1282.000 to 1287.975 MHz are coordinated repeater outputs with inputs located 12 MHz below at 1270.000 to 1275.975 MHz. Channel assignments are made on 25 kHz spacing starting at 1282.000 MHz.

The frequencies from 1290.00 to 1293.975 MHz are coordinated repeater outputs with inputs located 20 MHz below at 1270.000 to 1273.975 MHz. Channel assignments are made on 25 kHz spacing starting at 1290.000 MHz.

Auxiliary Links and Control
The frequencies from 1259.00 to 1259.9875 MHz are available for use as point to point auxiliary links control receivers. Channel assignments are made on 12.5 kHz spacing starting at 1259.00 MHz.

ATV
Coordinated ATV operation shall occur between 1240.00 to 1255.00, 1252.00 to 1258.00, and 1276.00 to 1282.00 MHz.

Simplex
Simplex operation shall be permitted between 1294.00 and 1295.00 MHz. The recognized National Simplex calling frequency is 1294.50 MHz.

1240.0000 - 1255.0000	**ATV, AM or FM**
1252.0000 - 1258.0000	**ATV, AM video carrier 1253.25**
1258.0000 – 1258.9750	Digital
1259.0000 - 1259.9875	**NB FM point to point links (12.5 kHz spacing)**
1260.0000 - 1267.0000	Satellite uplinks, experimental
1267.0000 – 1270.0000	Reserved for future expansion / experimental
1270.0250 - 1276.9750	**Repeater inputs, (25 kHz spacing)**
1276.0000 - 1282.0000	**ATV, AM video carrier 1277.25**
1282.0000 - 1287.9750	**Repeater outputs paired with 1270-1276**
1288.0000 - 1290.0000	Wide Band experimental,
1290.0250 – 1293.9750	**Repeater outputs paired with 1270-1274**
1294.0000 - 1295.0000	Narrow Band FM simplex, every 25 KHz.
1294.5000	National simplex calling channel
1295.0000 - 1297.0000	Narrow Band weak signal (No FM)
1295.0000 - 1295.8000	SSTV, FAX, ACSSB experimental
1295.8000 – 1296.0000	EME / CW
1296.0000 - 1296.0500	EME Exclusive
1296.0700 - 1296.0800	CW Beacons
1296.1000	CW/SSB Calling frequency
1296.3000 – 1296.4000	Beacons
1296.4000 - 1296.6000	Crossband linear translator input
1296.6000 – 1296.8000	Crossband linear translator output
1296.8000 - 1297.0000	Experimental Beacons (exclusive)
1297.0000 - 1300.0000	Wideband Digital Communications

23 CM FM 12 MHz split Repeater Pairs

Input	Output
1270.025 –	1282.025
1270.050 –	1282.050
1270.075 –	1282.075

.. and every 25 kHz thereafter through ..

1275.925 –	1287.925
1275.950 –	1287.950
1275.975 –	1287.975

23 CM FM 20 MHz split Repeater Pairs

Input	Output
1270.025 –	1290.025
1270.050 –	1290.050
1270.075 –	1290.075

.. and every 25 kHz thereafter through ..

1273.925 –	1293.925
1273.950 –	1293.950
1273.975 –	1293.975

H. 13cm / 2300-2310 and 2390-2450 MHz MHz

Simplex

Simplex operation shall be permitted between 2305.00 and 2306.00 MHz. The recognized National Simplex calling frequency is 2305.20 MHz.

2300.0 - 2303.0	High-rate data
2303.0 - 2303.5	Packet
2303.5 - 2303.8	TTY packet
2303.9 - 2303.9	Packet, TTY, CW, EME
2303.9 - 2304.1	CW, EME
2304.1	Calling frequency
2304.1 - 2304.2	CW, EME, SSB
2304.2 - 2304.3	SSB, SSTV, FAX, Packet AM, Amtor
2304.30 - 2304.32	Propagation beacon network
2304.32 - 2304.40	General propagation beacons
2304.4 - 2304.5	SSB, SSTV, ACSSB, FAX, Packet, AM, experimental
2304.5 - 2304.7	Crossband linear translator input
2304.7 - 2304.9	Crossband linear translator output
2304.9 - 2305.0	Experimental beacons
2305.0 - 2305.2	FM simplex (25 kHz spacing)
2305.20	FM simplex calling frequency
2305.2 - 2306.0	FM simplex (25 kHz spacing)
2306.0 - 2309.0	FM Repeaters (25 kHz) input
2309.0 - 2310.0	Control and auxiliary links
2390.0 - 2396.0	Fast-scan TV
2396.0 - 2399.0	High-rate data
2399.0 - 2399.5	Packet
2399.5 - 2400.0	Control and auxiliary links
2400.0 - 2403.0	Satellite
2403.0 - 2408.0	Satellite high-rate data
2408.0 - 2410.0	Satellite
2410.0 - 2413.0	FM repeaters (25 kHz) output
2413.0 - 2418.0	High-rate data
2418.0 - 2430.0	Fast-scan TV
2430.0 - 2433.0	Satellite
2433.0 - 2438.0	Satellite high-rate data
2438.0 - 2450.0	WB FM, FSTV, FMTV, SS experimental

XVI. Appendix 2: Close Spacing of Amateur Radio Repeaters

The Wisconsin Association of Repeaters (W.A.R.) as a member of The Mid American Coordination Council (MACC), agrees, and in general adheres to the minimum spacing recommendations (distance between transmitter sites) for Amateur Radio Repeaters as set forth by MACC.

The Board and Membership of W.A.R. however, also recognizes the limited frequency spectrum left available for the establishment of new Amateur Radio Repeaters in Wisconsin. We therefore establish, and with this document create guidelines for the "Close Spacing" of Amateur Radio Repeaters within Wisconsin and between our neighboring states.

"Close Spacing" refers to allowing the establishment of Amateur Radio Repeater Systems located less than the 120 mile minimum distance recommended by MACC. In order to allow two systems to be viable and operate with a minimum of interference between the systems, the following guidelines and requirements must be followed and met.

1. In general, the Frequency Coordinator of W.A.R. must be fully informed of the design and plans for the proposed system. The Frequency Coordinator is the best source of information and help in trying to allow for new systems to be established.

2. Guidelines for a Close Spacing Coordination:
   A. Submission of a completed W.A.R. Coordination Application
   B. Submission of a completed W.A.R. ERP Worksheet
   C. Submission of a completed W.A.R. HAAT Worksheet
      Forms are available on the W.A.R. web site at:
      www.wi-repeaters.org/forms.htm
   D. The following minimum distances may be allowed for a Close Spaced Coordination.

144 MHz band	90 statute miles
220 MHz band	70 statute miles
440 MHz band	60 statute miles
902 MHz band	60 statute miles
1.2 GHz band & Up	60 statute miles

   E. The ERP, HAAT and assigned CTCSS tone, of the main and remote site locations of a Close Spaced Coordinated Repeater may not be changed without the prior approval of the W.A.R. Frequency Coordinator.

   F. The use of remote receiver sites should not encroach upon the coverage area of the other "Close Spaced" machine involved in the coordination.

3. General System Requirements for a Close Spaced Repeater:

A. The Repeater must have CTCSS tone encoded on its output, and all receivers shall decode CTCSS tone.
The CTCSS tone used shall be assigned by the Frequency Coordinator.

B. The height of the transmitter antenna shall be less than 300 ft. above the average terrain (HAAT).

C. The Repeater shall have a maximum ERP of 100 Watts.

Before granting a Close Spacing Coordination, the W.A.R. Frequency Coordinator will evaluate the above information, looking also at the topography and signal path between the two systems. If the system will be Close Spaced with a Repeater in an adjoining state, the W.A.R. Frequency Coordinator will share this information with the involved states Frequency Coordinator, and jointly evaluate the proposed Coordination.

W.A.R. establishes this "Close Spacing" concept in an effort to allow for better and more efficient use of our allocated frequency spectrum. With careful use of CTCSS tone, complete information on the ERP, HAAT and propagation of a particular machines' coverage area, and cooperation between trustees and State Frequency Coordinators, we feel the concept of Close Spacing will work for the benefit of all involved.

XVII. Appendix 3: Cross-band Repeater Operation

The following frequency subband has been set aside by the Wisconsin Association of Repeaters for ad-hoc cross-band repeater use. For example, this is the area of the 440 band that should be used for 'cross-banding' from an 'HT' through a car, and then into a local 2 meter repeater.

The frequency sub-band is 446.4125 to 446.4875 MHz, with a 12.5 KHz step spacing.

Cross Banding Frequencies on UHF:

446.4125 446.4250 446. 4375 446.450 446.4625 446.475 446.4875

These frequencies may be used without fear of causing problems to established, but unpublished coordinated links. Their use is for the occasional user, such as setting up at a swapfest, special event, or some gathering where such communication would be useful. It is not intended for any long term operation, and is subject to any other operations of the same nature.